

DECLARATION

I, Toru Hatori, of ArkMori Building 13F, 12-32, Akasaka 1-chome, Minato-ku, Tokyo 107-6028, Japan, do solemnly and sincerely declare that I well understand the Japanese language and the English language and that the attached document is a full and faithful translation made by me of Japanese patent application No. Hei. 10-131483 filed in Japan on May 14, 1998.

A handwritten signature in black ink, appearing to be "Toru Hatori", written over a solid horizontal line.

Toru Hatori

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[List of Filed Articles]

[Article Name]	Specification	1
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(TITLE OF THE DOCUMENT) Specification
(TITLE OF THE INVENTION) Ink Cartridge
(SCOPE OF THE PATENT CLAIM)

(Claim 1) An ink cartridge wherein there is provided, on the upper surface of a lid covering the opening portion of a main body of the ink cartridge, a snaky groove of which one end is communicated with a vent hole and the other end of which extends to a through hole, and wherein there is formed, in a blank space of the upper surface of the above lid, a shallow recess portion for deaeration.

(Claim 2) The ink cartridge according to Claim 1, wherein the above recess portion for deaeration is defined and formed in the shape of a lattice by projection stripes.

(Claim 3) The ink cartridge according to Claim 1 or 2, wherein there is provided, in the above projection stripe, a notch, by which the adjacent recess portions are communicated with each other.

(Claim 4) The ink cartridge according to Claim 1, wherein the above projection stripes are formed so as to correspond to partition walls for defining ink chambers, and an engagement groove to which the above partition wall is fitted is disposed at the ink chamber side portion of the above projection stripe.

(Claim 5) The ink cartridge according to Claim 1, wherein the above snaky groove is formed in accordance with ribs for compressing porous member which are disposed on an ink chamber side surface of the above lid.

(Claim 6) The ink cartridge according to Claim 1, wherein deposited portions are formed slightly high around the above snaky groove, and a recess portion is provided in the wide

portion of the above deposited portions.

(Claim 7) The ink cartridge according to Claim 1, wherein a through hole of the above snaky groove is spread and a plurality of the above through holes are arranged fanwise.

(Claim 8) The ink cartridge according to Claim 1, wherein the above snaky groove is covered with a film so that the film can be peeled off, and it is further covered with another film so as to stride across the former film.

(BRIEF DESCRIPTION OF THE INVENTION)

(0001)

(Technical Field of the Invention)

The present invention relates to an ink cartridge used in an ink jet printer.

(0002)

(Prior Art)

An ink cartridge mounted on a carriage in which a through hole communicated with an ink supply port is covered with a filter and a porous member impregnated with ink is located on the filter has been disclosed in Japanese Patent Laid-Open No. Hei 8-132635 by this applicant.

(0003)

This type ink cartridge is formed in the shape of a box so that it can store ink as much as possible therein, and further the ink cartridge is sealed by a film and packed air-tightly with a flexible package by decompressing the inside thereof so that air bubbles are not produced in ink, and thereafter transported and taken charge of. However, in case that the packed ink cartridge has been taken charge of for a long period, there was a problem that air bubbles were produced due to

resolution of ink component and air dissolved in the ink.

(0004)

Accordingly, the inside of the package is deaerated by larger decompression than the inside of the ink cartridge, the ink cartridge is packed hermetically, and a gap is sufficiently secured in the inside of the package by putting a buffer material such as a corrugated cardboard or the like therein, whereby gas which produces due to resolution of the ink component and air dissolved in the ink is removed by movement of the gas between the gap and the inside of the ink cartridge, so that generation of the air bubbles in the ink is prevented. However, the whole capacity of the ink cartridge packed by the package is accordingly increased by the capacity of the buffer material, so that ink stored capacity of the ink cartridge must be decreased in order to suppress the increase of the capacity.

(0005)

(Subject to be Solved by the Invention)

In view of this problem, an object of the present invention is to provide a new ink cartridge which can prevent gas from mixing in the ink for a long period without reducing the ink stored capacity.

(0006)

(Means for Solving the Subject)

Namely, in an ink cartridge of the present invention in order to achieve this subject, there is provided, on the upper surface of a lid covering the opening portion of a main body of the ink cartridge, a snaky groove of which one end is communicated with a vent hole and the other end of which extends to a through hole, and there is formed, in a space of the upper

surface of this lid, a recess portion for deaeration. Hereby, even if the ink cartridge is packed in decompression state, buffer material or the like is not required and it is prevented that gas is mixed in the ink.

(0007)

~~(Embodiment of the Invention)~~

Embodiment of the present invention will be described below.

Figs. 1 and 2 show respectively an ink cartridge of one embodiment of the present invention, which is so designed as to store five colors of ink (light magenta, dark magenta, light cyan, dark cyan, and yellow).

(0008)

First, a main body of an ink cartridge 1 will be described. The main body of this ink cartridge 1 is made of polypropylene that is low in transmission of vapor but slightly inferior in strength, and is rectangular parallelepiped-shaped so as to store as a large quantity of ink as possible therein. Further, in the main body of this ink cartridge 1, ink chambers 2a, 2e for storing dark magenta ink and dark cyan ink, and wide ink chambers 2a, 2b, 2d for storing a larger quantity of light magenta ink, light cyan ink and yellow ink are formed and respectively defined by partition walls 3. Further, cylinder ink supply ports 4a--e are projectingly formed at one ends of bottom surfaces 6 of these ink chambers 2a - e on a recording head side so as to be joined to one another.

(0009)

In the main body of this ink cartridge 1, the ink supply ports 4a - e are formed at an equal distance at the bottom

surfaces of the ink chambers 2a - e so as to communicate with each ink needles projectingly disposed on a recording head at an equal distance, irrespective of the widths of the ink chambers 2a - e.

(0010)

~~-----~~ On the other hand, foam compressing projections 7a - e are provided on each ink supply chambers 2a - e sides of the main body of the ink cartridge 1, and through-holes 8a - e disposed at these projections 7a - e and the ink supply ports 4a - e corresponding to each through holes 8a - e deviate from each other in the shape of a crank so that they are communicated with each other.

(0011)

On the other hand, each section of the foam compressing projections 7a - e protruding into the ink chambers 2a - e is formed in the shape of an ellipse so that each projection can fit each ink chambers 2a - e which are narrow. Further, a groove 9 is provided here, which is slant toward the through-holes 8a - e disposed at one ends in the longitudinal directions of the projections from the other ends of the projections to the ink supply ports 4. Hereby, the thickness of each projections 7a - e protruding inward is made as uniform as possible to suppress generation of the sink mark at the forming time, and simultaneously, air bubbles which produce below a filter 10 are discharged well.

In the figures, reference numeral 11 indicates a projection for preventing improper installation, which is protruded outward of the main body of cartridge 1.

(0012)

By the way, reference numeral 20 shown in figures is a lid for sealing an opening portion of the main body of the ink cartridge 1. In the interior of this lid 20, two-striped longitudinal ribs 21, 21 for pressing the porous member stored in each ink chambers 2a - e, that is, a foam 5 are spaced and projectingly formed at each ink chambers 2a - e. Further, in these longitudinal ribs 21, 21, a portion on the ink supply ports 4a - e side is formed higher than other portions and reduces the vacant hole of the foam 5 therein in cooperation with the foam compressing projections 7a - e protruded inside the ink chambers 2, whereby ink absorbed uniformly in the foam 5 is collected to the portions of the ink supply ports 4a - e by resultant strong capillary action as the ink is decreased.

(0013)

In this lid 20, an ink charging hole 23 and a vent hole 24 are piercingly formed at the center portion of the lid and the portion on the ink supply port 4 side, correspondingly to each ink chambers 2a - e. Further, on the upper surface of this lid 20, snaky grooves 28 are labyrinthically formed at the respective ink chambers 2a - d, of which starting end portions are communicated with the vent holes 24 and the tail ends of which extend to through holes 26a - e disposed on the upper surface of the lid 20.

(0014)

By coating this lid 20 with a film 35, the snaky groove 28 functions as a capillary tube, and when the through holes 26a - e are opened to air, ink inside the ink chambers 2a - e is prevented from evaporating by large fluid passage resistance as much as possible.

(0015)

This film 35 is divided into a peeling portion 36 which covers the through holes 26a - e and a residual portion 37 which covers the snaky groove 28, and a main portion 38 which connects these portions to each other has cuts 39 arranged alternately on both sides thereof, from which the peeling portion 36 is cut off. When the ink cartridge is used, the peeling portion of the film 35 is peeled off, thereby to open the through holes 26a - e to the air and communicate the ink chambers 2a - e with the air.

(0016)

The through holes 26a - e on the lid 20 are opened fanwise and arranged in one position, whereby the through holes are opened to the air more reliably when the peeling portion 36 of the attached film 35 is peeled off.

(0017)

In a blank space of the lid 20 except the snaky grooves 28 and the through holes 26a - e, many numbers of recess portions 30 are arranged in longitudinal five rows in the shape of a lattice so as to correspond to the respective ink chambers 2a - e. Further, these recess portions 30 are formed as deaeration tanks which are communicated with one another by notches 32 respectively provided at transverse projection stripes 31 for defining these recess portions. Simultaneously, the transverse projection stripes 31 are provided at a proper distance and in a proper position in order to secure the rigidity of the recess portions 30 and support the film 35 coated on the lid 20.

(0018)

Rear sides of four longitudinal projection stripes 33 which partition these recess portions 30 longitudinally function as a tapering guide groove 34 which is fitted to each partition walls 3 of the ink chambers 2a - e, as shown in Fig. 2(c), thereby to make the thickness of the lid 20 uniform and prevent a sink mark from producing in this portion, and also to strongly hold the form of the whole of the ink cartridge when the opening portion of the ink cartridge is lidded.

(0019)

Fig. 3 shows a state in which this ink cartridge is packed. In case that the main body of the ink cartridge 1 is packed with a package 80 having flexibility and the inside of the package is decompressed and sealed by larger deaeration than the inside of the ink cartridge, gas moves between the gap of the recess portion 30 and the ink chambers 2a - e, and gas which produces due to resolution of the ink component and air dissolved in the ink move to the gap of the recess portion 30, so that even if the ink cartridge which has been decompressed and packed is held in trust for a long period, air bubbles never produce in the ink.

(0020)

On the contrary, Figs. 4 and 5 show an ink cartridge according to a second embodiment of the present invention, which stores single colored ink such as black or the like therein.

(0021)

In the figures, in a main body of an ink cartridge 41, an ink supply port 44 is provided at one end of a bottom surface 46 thereof on a recording head side, and a projection 47 for

compressing a foam 45 is projectingly formed within an ink chamber 42, correspondingly to this ink supply port 44.

(0022)

This projection 47 is formed in the shape of such a large ellipse as to extend from the recording head side of the ink chamber 42 to the other end side. At one end of this projection on the recording head side, a through hole 48 communicated with the ink supply port 44 is provided, and further, a groove 49 is disposed which is slant toward the through hole 48 on the ink supply port 44 side, in order to make uniform a biased thickness portion 51 of the projection on this recording head side, so that air bubbles produced under a filter 50 can be discharged outside through the through hole 48 along this groove 49.

(0023)

A center of a top surface 52 of this projection 47 is formed slightly lower than both sides thereof by peripheral edge projection stripes 53 provided on the outer periphery of the projection so as to form a fluid passage of ink 4.

(0024)

On the contrary, In a lid 60 for sealing the opening portion of the main body of the ink cartridge 41, as shown in Fig. 5(c), longitudinal ribs 61 and transverse ribs 62 respectively for compressing the foam 45 therein are provided, and further there is, on one half surface of the lid, provided a snaky groove 68 of which one end is communicated with a vent hole 64 and the other end of which extends to an opening portion 66 of the other half surface of the lid.

(0025)

This snaky groove 68 is provided so as to correspond to the transverse rib 62 provided in the inner surface of the lid 60, as shown in Fig. 5(b) to make the thickness of the lid 60 as uniform as possible, so that generation of a sink mark is suppressed at the forming time.

~~-----~~ (0026) ~~-----~~

Further, a flat surface 71 is provided around this snaky groove 68 to heighten weldability of the film, and a recess portion 72 is provided in a wide portion of the welding area thereof in order to reduce an influence due to expansion of air when the film is welded.

(0027)

On the other hand, there is also provided a shallow recess 70 as an deaeration tank at a vacant space of this lid 60 where the through hole 66 of the snaky groove 68 is provided, and in this ink cartridge which is even in the decompressed and packed state, gas in ink can be removed similarly to in the ink cartridge shown in Fig. 3.

(0028)

Fig. 6 shows an upper surface of the ink cartridge. The upper surface of its lid 60 is covered with a film 90, and this film 90 is divided into a peeling portion 91 for coating the through hole 66 (not shown) and a residual portion 92 for coating the snaky groove. A main portion 93 which connects these portions to each other has cuts 98 arranged alternately on both sides thereof, from which the peeling portion 91 is cut off. When the ink cartridge is used, the peeling portion 91 of the film 90 is peeled off, thereby to open the through hole 66 to the air and communicate the ink chamber 42 with the air.

(0029)

When this peeling portion 91 is peeled off, in case that the residual portion 92 is also simultaneously peeled off, the ink chamber 42 is directly opened to the air through the vent hole and evaporation of water in the ink is promoted. However, as shown in Fig. 6(b), in this embodiment, an overlable 100 protects the residual portion 92 of the film 90 so as to stride across this portion, whereby peeling of the residual portion accompanied with the peeling of the peeling portion 91 can be previously prevented.

(0030)

(Effect of the Invention)

As described above, according to the present invention, as the shallow recess portion for deaeration is formed at the vacant space of the lid of the ink cartridge, a space can be formed between the package and the lid without using the buffer member or the like even in the decompressed state, whereby even in case that the ink cartridge is preserved for a long period, deaeration of the ink is heightened, so that it is possible to prevent the air bubbles from producing in the ink.

(0031)

Further, the snaky groove is provided on the surface of the lid so as to correspond to the ribs on the ink chamber side, whereby the thickness of this portion is made uniform and generation of the sink mark at the forming time is suppressed, so that the forming accuracy of the lid can be heightened more.

(BRIEF DESCRIPTION OF DRAWINGS)

(Fig. 1)

Figs. 1(a), (b), and (c) are respectively a plan view of a color ink cartridge showing one embodiment of the present invention, a sectional view taken along a line A-A in Fig. 1(a), and a sectional view taken along a line B-B in Fig. 1(a).

--- (Fig. 2)

Figs. 2(a), (b), and (c) are respectively a plan view of a lid of the ink cartridge of Fig. 1, a sectional view taken along a line A-A in Fig. 2(a), and a sectional view taken along a line B-B in Fig. 2(a).

(Fig. 3)

Fig. 3 is a side view of the ink cartridge packed with a package.

(Fig. 4)

Figs. 4(a), (b), and (c) are respectively a plan view of an ink cartridge showing another embodiment of the present invention, a sectional view taken along a line A-A in Fig. 4(a), and a sectional view taken along a line B-B in Fig. 4(a).

(Fig. 5)

Figs. 5(a), (b), and (c) are respectively a top view of a lid of the ink cartridge of Fig. 4, a sectional view taken along a line A-A in Fig. 5(a), and an inside view thereof.

(Fig. 6)

Fig. 6(a) and (b) are perspective views showing a top surface of the ink cartridge.

(Description of Symbols)

- 1, 41 ink cartridge
- 2a - e, 42 ink chamber
- 3 partition wall
- 4a - e, 44 ink supply port

20, 60 lid

21, 61, 62 rib

28, 68 snaky groove

26a- e, 66 through hole

30, 70 recess portion for deaeration

31, 33 projection stripe

32, 98 notch

35, 90 film

100 overlavel

(TITLE OF THE DOCUMENT) Abstract

(ABSTRACT)

(OBJECT) To heighten deaeration in the packed state

(MEANS FOR ACHIEVING THE OBJECT) A snaky groove 28 which extends from an air communication port 24 to a through hole 26 is provided in a lid 20 for covering an opening portion of a main body of an ink cartridge 1, and a recess portion 30 for deaeration is provided at the vacant space of this snaky groove 26, whereby even if the ink cartridge is packed in the decompressed state, a space can be formed between a package and the lid to heighten deaeration of ink.

(SELECTED DRAWING) Fig. 1(a)

[図1]

Fig. 1

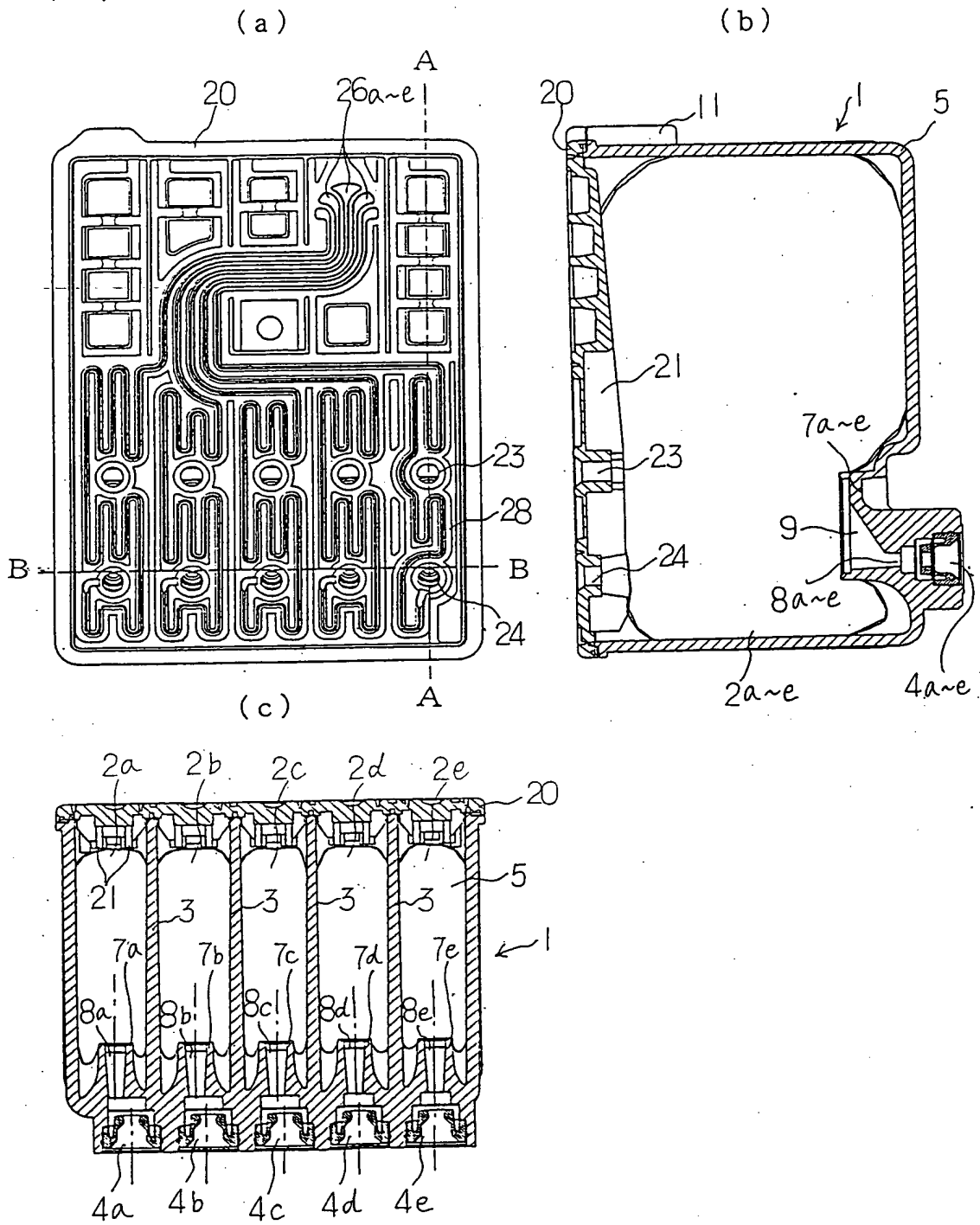
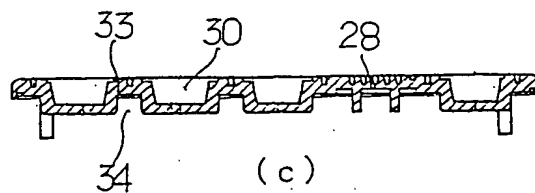
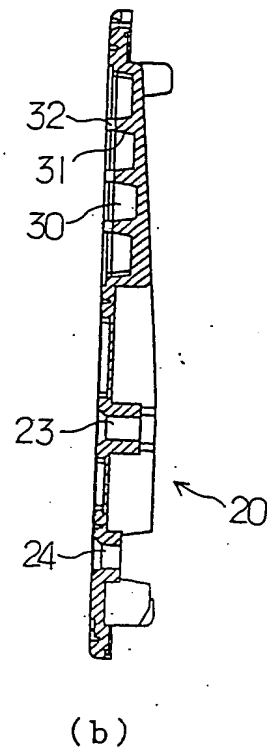
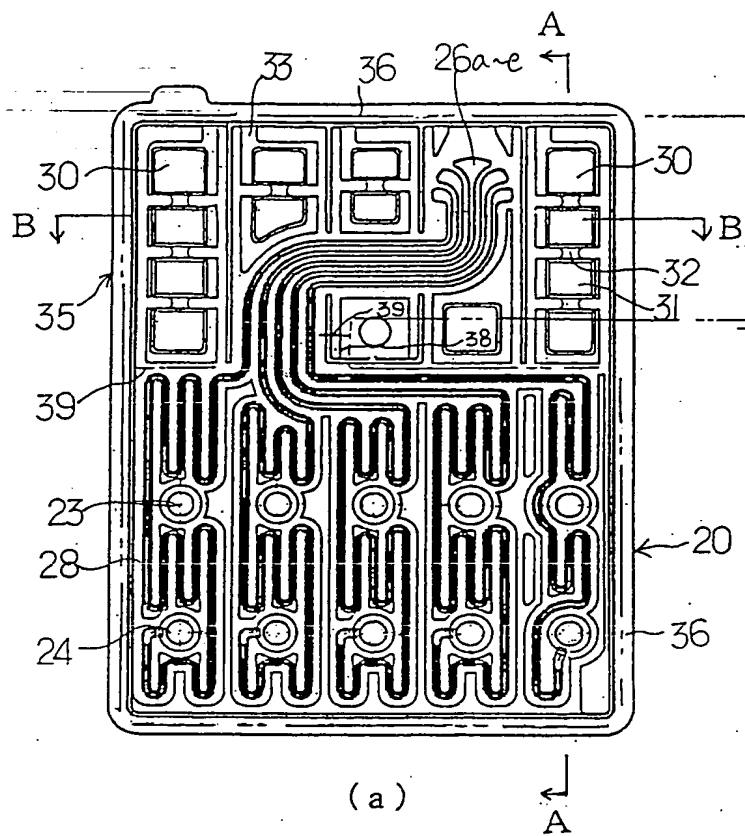


FIG. 2

FIG. 2



【~~図3~~】

FIG. 3

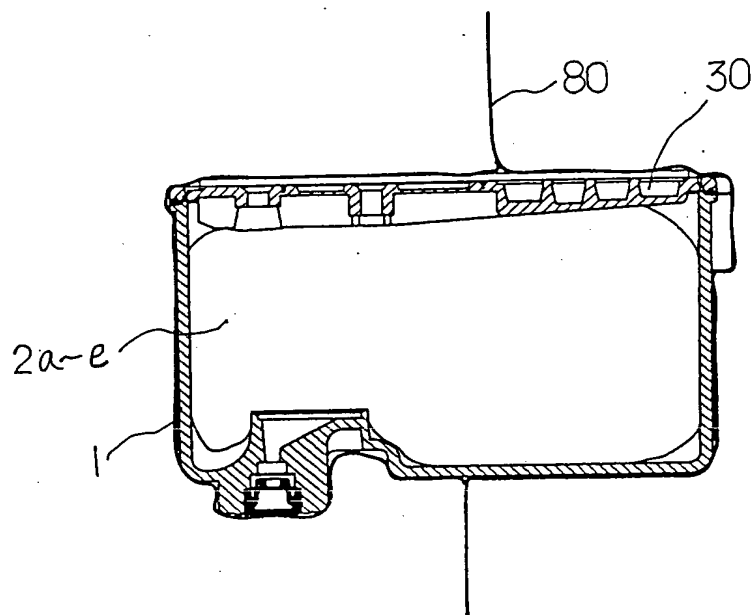
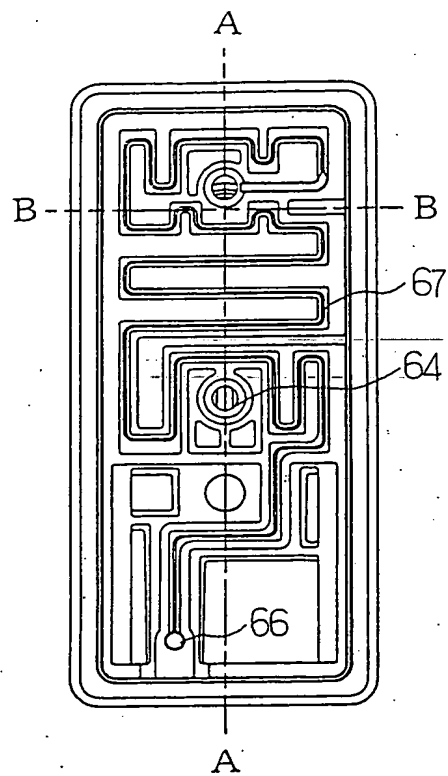


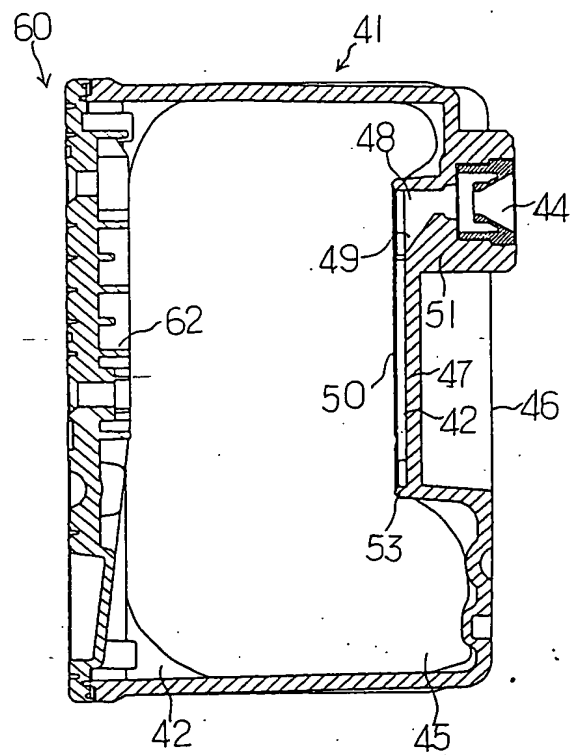
FIG. 4

FIG. 4

(a)



(b)



(c)

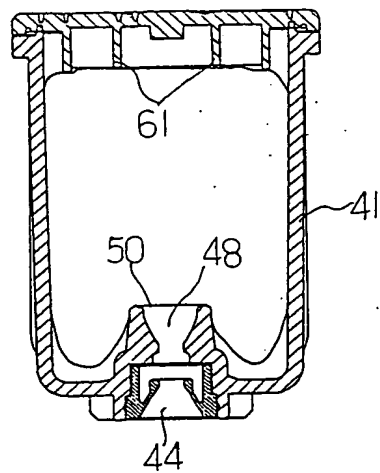


FIG. 5

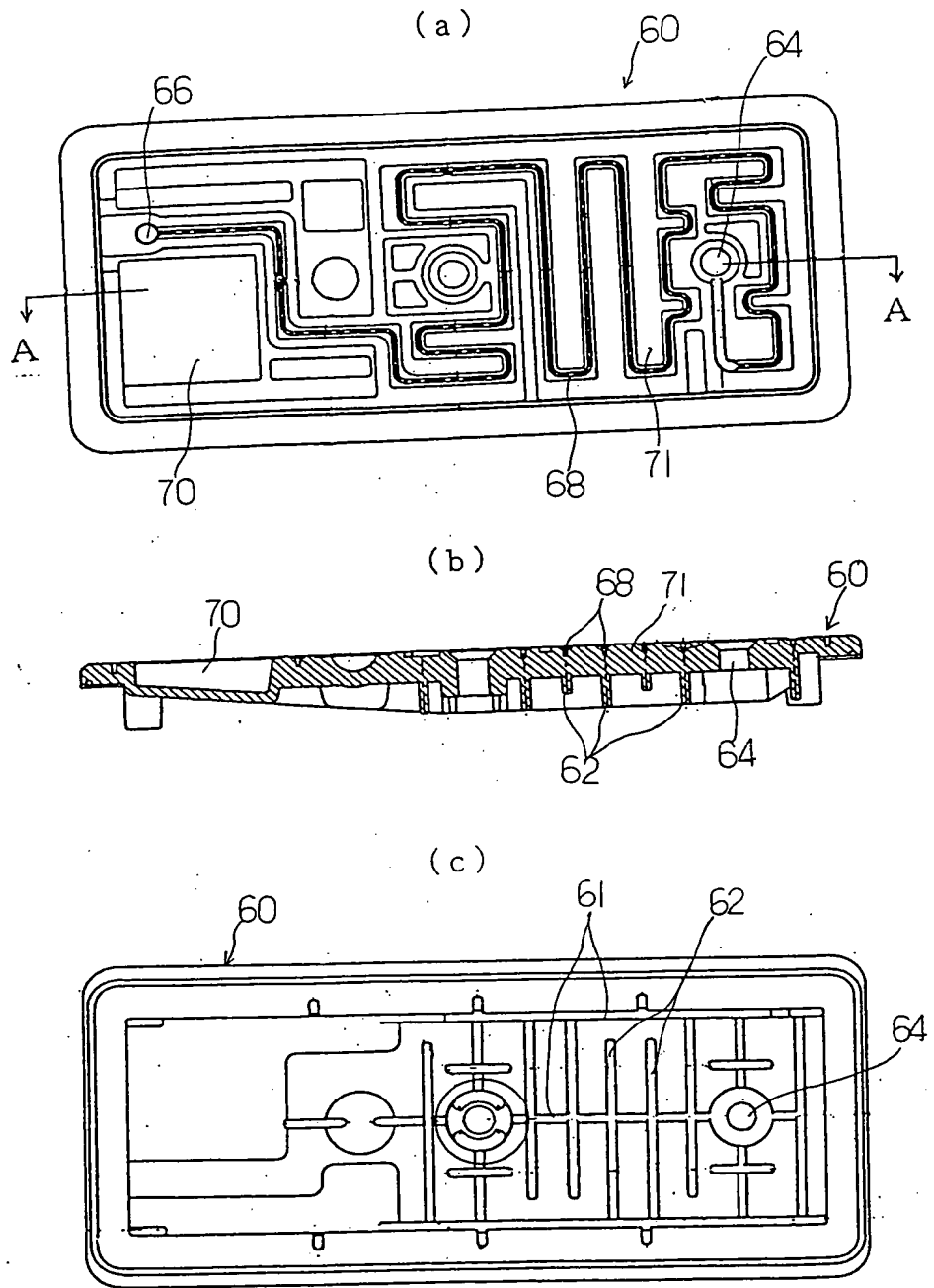
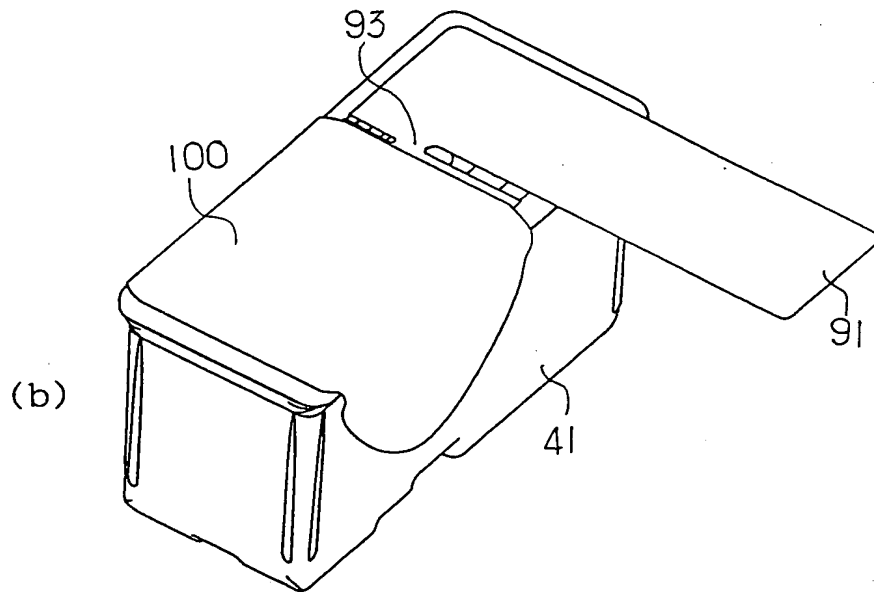
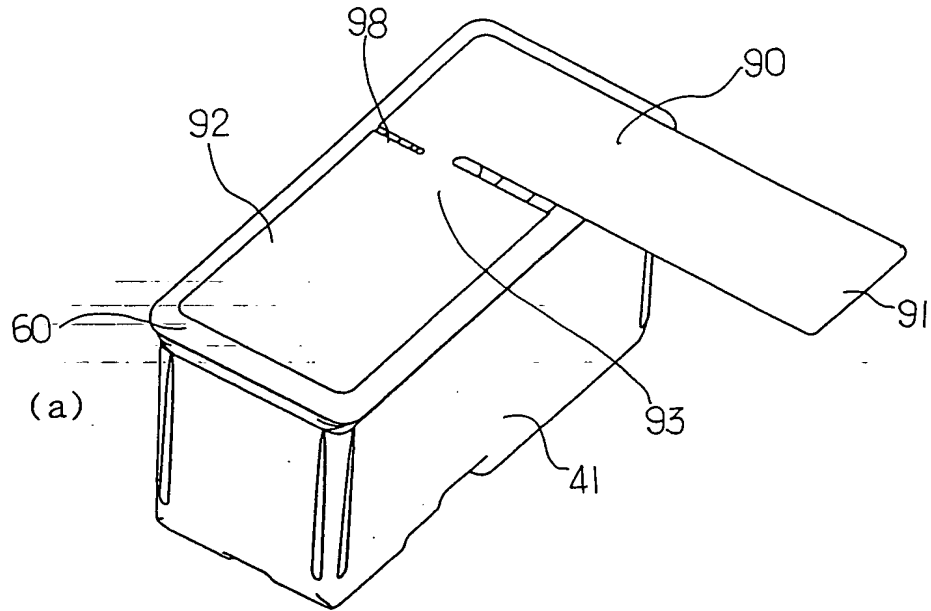


FIG. 6

FIG. 6



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